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Congenital Cardiology Solutions

THE EFFECT OF MODIFIED ULTRAFILTRATION ON ANGIOPOIETINS IN PEDIATRIC CARDIOTHORACIC SURGERY

Poster Contributions
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Background: Cardiopulmonary bypass (CPB) subjects a patient's blood to hemodilution and nonphysiologic conditions which result in a systemic inflammatory response. Modified ultrafiltration (MUF) counteracts hemodilution, but may also improve outcomes by pro-inflammatory cytokine removal. Vascular growth factors angiopoietin-1 (ang-1) and ang-2 play opposing roles in the capillary leak syndrome seen in patients following cardiac surgery. We hypothesize that the benefits of MUF include the removal of pro-inflammatory mediators, such as ang-2.

Methods: We performed a prospective cohort study. All patients ≤ 18 years of age undergoing cardiac surgery with CPB were offered enrollment. Three serum samples were obtained from each patient: 1. preoperatively, 2. following CPB, and 3. upon intensive care unit (ICU) admission. A final fluid sample from the MUF effluent was also analyzed. Ang-1 and ang-2 levels were determined using sandwich ELISA. The MUF effluent was used to calculate ang-1 and ang-2 percent extraction. The serum sample trends were analyzed by repeated measures ANOVA and paired t tests. The percent extraction was analyzed using the Wilcoxon Signed Rank Test.

Results: To date, 24 subjects have been enrolled. Mean ang-1 levels significantly decreased across all time points (pre CPB 2,987 ± 3,012 ng/mL, post CPB 1,635 ±1,046 ng/mL, ICU admission 1,036 ± 559 ng/mL; $p<0.01$). Ang-2 levels were significantly elevated at ICU admission when compared to both pre and post CPB levels (pre CPB 7,425 ± 3,811 ng/mL, post CPB 6,430 ± 3,373 ng/mL, ICU admission 11,126 ± 7914 ng/mL; $p<0.01$). There was no significant difference between the mean ang-1 or ang-2 percent extraction within MUF effluent (1.8% ±0.1%, 1.1% ±3.2%, respectively; $p=0.34$). In addition, the ang-2/1 ratio significantly increased across all time points (3.65 ± 2.41, 5.84 ± 6.58, 16.16 ± 17.87, respectively; $p<0.01$).

Conclusion: Ang-2/1 ratios significantly increase following CPB in children. The process of MUF removes both ang-1 and ang-2 equally. While data collection is ongoing, our preliminary results suggest that the clinical benefits of MUF cannot be attributed to the removal of larger quantities of ang-2 compared to ang-1.